REMARKS

The present invention is a method for constructing a reservoir model representative of an underground reservoir, including discretizing said reservoir by a set of grid cells, and associating with said reservoir model a permeability field constrained by *a priori* geologic data and dynamic data collected in said reservoir by measurements and observations. The method constructs an initial reservoir model including generating a permeability field in accordance with stochastic model coherent with the *a priori* data; identifies zones inside said reservoir; calculates effective permeabilities of said zones and carries out, by means of a simulator, a simulation of fluid flows to estimate corrections to be brought to said effective permeabilities to improve calibration relation to said dynamic data; and propagates said corrections to said set of grid cells to said reservoir model, by means of an iterative optimization process comprising minimizing a function which depends on said correction using a technique of gradual deformation of utilizations of said stochastic model.

Furthermore, the method is useful for the development of reservoirs by constructing the reservoir model and using the model to develop the underground reservoir. See the original Abstract of the Disclosure which, in the last sentence, makes reference to "—Applications: notably oil reservoirs development for example". The specification has been amended at the end to recite "The invention has application notably in the development of oil reservoirs."

With respect to the Examiner's Response to Arguments pertaining to the drawings, submitted herewith are Replacement Drawings with English language legends which were in the undersigned's file and which were believed to have been

submitted with the Preliminary Amendment even though the "revised drawings" box was not checked.

Claims 27-42 stand rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. Specifically, the Examiner reasons as follows.

> The claims are directed to an abstract idea and fail to set forth a practical application to produce a real world result. The final result of claim 27 is directed to propagating corrections to a set of grid cells of a reservoir model. However, the claim lacks a tangible result because no application is provided to the reservoir model in order to produce a real-world result. Therefore claim 27 fails to produce a useful, concrete, and tangible final result. Claims 28-42 depend from claim 27 and do not overcome the deficiencies of claim 27.

These grounds of rejection are traversed for the following reasons.

The major premise of the Examiner's rejection seems to be that a reservoir model, even though well known to be useful in the development of oil reservoirs, is nevertheless <u>not</u> tangible subject matter and therefore, not statutory subject matter. This conclusion, it is submitted, is erroneous.

As the Examiner is aware, reservoir models are resident on computers and use for the development of reservoirs is taught in paragraph [0045] of the Substitute Specification.

Claim 27, in the preamble, recites "a method for constructing a reservoir model representative of an underground reservoir, including discretizing said reservoir by a set of grid cells, and associating with said reservoir model a permeability field constrained by *a prior* geologic data and dynamic data collected in said reservoir by measurements and observations. What is recited in the preamble is that the reservoir model is representative of a real underground reservoir in terms of a permeability field constrained by *a prior* geologic data and dynamic data collected in the reservoir by measurements and observations which are real world

data. In other words, the model cannot be implemented without acquiring actual real world data which is utilized in the model. The ultimate model that results after the steps of claim 27 are performed is a model of the actual underground reservoir based upon real world data transformed by the claimed method steps. The model is represented and used by the output of a computer such as a computer screen.

The acquired real world data is actually processed by a series of steps as follows:

a) constructing an initial reservoir model including generating a permeability field in accordance with a stochastic model, coherent with the a priori geologic data;

b) identifying zones inside said reservoir;

c) calculating effective permeabilities of said zones and carrying out, by means of a simulator, a simulation of fluid flows, to estimate corrections to be brought to said effective permeabilities to improve calibration in relation to said dynamic data; and

d) propagating said corrections to said set of grid cells of said reservoir model, by means of an iterative optimization process comprising minimizing a function which depends on said corrections, using a technique of gradual deformation of realizations of said stochastic model.

Therefore, it is seen that the actual geologic data and dynamic data is transformed in accordance with the recited steps of constructing, identifying, calculating and propagating to produce the resultant reservoir model.

It is submitted that the original acquired geologic data and dynamic data which are transformed by the recited steps into the model qualify as a tangible result. M.P.E.P. §2106(b) only requires that "the tangible requirement does require that the claim must recite more than a 35 U.S.C. §101 judicial exception, in that the process claim must set forth a practical application of that judicial exception to produce a real world result." A model of an actual underground reservoir based

upon data acquired from the reservoir which is transformed as part of the model is a real world tangible result.

If the Examiner persists in the stated grounds of rejection, it is requested that he specifically address the Applicants' assertion that models of an underground reservoir based upon actual acquired and processed data which are resident on computers and useful for developing the modelled reservoir are a tangible result.

Moreover, claim 28 has been amended to recite that the method is for development of reservoirs by constructing the reservoir model and using the model to develop the underground reservoir. All remaining claims have been made dependent from claim 28 with claim dependent on claim 27. Therefore, the rejection of claims 28-42 is submitted to be overcome in view of the recitation of using the reservoir model to develop the underground reservoir as disclosed in the original specification.

Claims 27-42 stand rejected under 35 U.S.C. §102 as being anticipated by U.S. Publication No. 2002/0013687 (Ortoleva). These grounds of rejection are traversed for the following reasons.

For an anticipation rejection to be appropriate, it is necessary for the Examiner to demonstrate that each and every limitation of the claims which are alleged to be anticipated are either explicitly present or inherently present in the reference. When this standard is applied, claims 27-42 are not anticipated or rendered obvious by Ortoleva.

The method for constructing a reservoir model representative of an underground zone involves associating with said reservoir model a permeability field constrained by *a priori* geological data and dynamic data collected in said reservoir

by measurements and observations. Moreover, the method includes "constructing an initial reservoir model including generating a permeability field...which is recited as being constrained by *a priori* geologic data and dynamic data collected in said reservoir followed by identifying zones inside said reservoir; calculating effective permeabilities of said zones and carrying out, by means of a simulator, a simulation of fluid flows to estimate corrections to be brought to said effective permeabilities to improve calibration in relation to said dynamic data; and propagating said corrections to said set of grid cells of said reservoir model, by means of an iterative optimization process comprising minimizing a function which depends on said corrections, using a technique of gradual deformation of realizations of said stochastic model."

It is noted that the Examiner has referred to paragraph [0090] as representing identifying zones inside the reservoir and then further refers to calculating effective permeabilities of said zones being in paragraph [0097]. However, it should be noted that paragraphs [0090] – [0094] pertain to Basin reaction, transport model called Basin RTM. See paragraph [0072]. Paragraph [0097] pertains to details of an Exemplary Embodiment. The zones which are described in paragraph [0097] do not pertain to dynamic data as processed in the claims.

The Examiner's reliance on paragraphs [0097] and [0098] meeting "associating with said reservoir model a permeability field constrained by a priori geologic data and dynamic data collected in said reservoir..." is misplaced. Ortoleva pertains in the cited portions to a Basin RTM which does not describe the use of dynamic data pertaining to a permeability field associated with a reservoir model. See paragraph [0071].

Dynamic data is only referred to beginning in paragraph [0212]. Paragraph [0239] describes a geostatistical method as being extensively used to construct the state of a reservoir which do involve "[t]wo significant methods have been developed to integrate the dynamic flow of information from production and monitoring wells and static data". Accordingly, insofar as the Examiner is relying upon the utilization of dynamic data collected in said reservoir by measurements and observations, the dynamic data would have to be described in paragraphs [0239] and [0240]. Paragraphs [0239] and [0240] do not disclose steps b-d of claim 27 which require manipulation of dynamic data pertaining to a permeability field.

The present invention as claimed recites in the final step "propagating said corrections to said set of grid cells of said reservoir model, by means of an iterative optimization process comprising minimizing a function which depends on said corrections, using a technique of gradual deformation of realizations of said stochastic model". The previously estimated corrections are utilized which are produced by the calculation step "to improve calibration in relation to said dynamic data". The aforementioned calculation step passes the estimated corrections to the propagating step thereby adjusting the effective permeabilities of the zones without performing flow simulation at each iteration.

This subject matter is not taught by Ortoleva as set forth in the steps of claim 27. Moreover, the Examiner has not demonstrated that there is an "identifying of zones inside said reservoir" which are associated with dynamic data collected in the reservoir by measurements and operations followed by the calculating and propagating steps which permits the invention to adjust the effective permeabilities of the zones without performing the flow simulation at each iteration.

If the Examiner persists in the stated grounds of rejection, it is requested that he demonstrate more specifically in Ortoleva where the utilization of dynamic data collected in the reservoir is associated with identifying zones inside said reservoir; calculating effective permeabilities of said zones in carrying out, by means of a simulator, a simulation of fluid flows to estimate corrections to be brought to said effective permeabilities to improve calibration in relation to said dynamic data; and propagating said corrections to said set of grid cells of said reservoir by means of an iterative optimization process comprising minimizing a function which depends on said corrections, using a technique of gradual deformation of realizations of said stochastic model.

In view of the foregoing amendments and remarks, it is submitted that each of the claims in the application is in condition for allowance. Accordingly, early allowance thereof is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (612.42904X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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